Windows® 2000 Programming Bible

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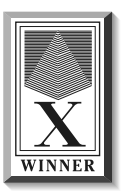

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John Mueller is a freelance author and technical editor. He has writing in his blood, having produced 43 books and almost 200 articles to date. The topics range from networking to artificial intelligence and from database management to heads down programming. Some of his current books include an ActiveX/ISAPI programmer's guide and a Windows NT Web server handbook. His technical editing skills have helped over 23 authors refine the content of their manuscripts, some of which are certification related. In addition to book projects, John has provided technical editing services to both *Data-based Advisor* and *Coast Compute* magazines. A recognized authority on computer industry certifications, he's also contributed certification-related articles to magazines like *Certified Professional Magazine*.

When John isn't working at the computer, you can find him in his workshop. He's an avid woodworker and candle maker. On any given afternoon, you might find him working at a lathe or putting the finishing touches on a bookcase. One of his newest craft projects is glycerine soap making, which comes in pretty handy for gift baskets. You can reach John on the Internet at JMueller@mwt.net. John is also setting up a new Web site at `http://www.mwt.net/~jmueller/`; feel free to take a look and make suggestions to improve it.

This book is dedicated to two very dear friends, Victor and Claudia.
Our times together always fill me with peace and joy.

Preface

Windows 2000 is one of the most highly anticipated and exciting releases in the history of the Windows product line. This product has more new features than many individual companies will ever use and definitely enough features to keep programmers busy for quite some time to come. In fact, the Windows 2000 operating system is so large and complex, some people wondered whether it would ever get released at all. However, the fact that you're reading this means that Microsoft finally got all of the pieces together, and we now have an operating system that will provide the functionality that programmers and customers alike have wished for.

So, what can this book offer you that you can't find anywhere else? Three key features make this book special. The first is in-depth theory. Unlike many books out on the market today, this one talks about the various COM interfaces, discusses the registry in detail, and allows you to see how the various pieces go together. The second is source code. The accompanying CD contains about 180MB of source code for a wide range of application types. Finally, this book is about resources, most importantly, those that you can find on the Internet. Throughout the book you will find references to Web site and newsgroups that will have information about anything you ever wanted to know about the topics being covered.

If you're looking for a good general book on the Windows 2000 operating system, this is the book for you. Although I don't provide encyclopedic coverage (who could, given the size of the operating system), you'll garner enough information to really understand the important new principles included in Windows 2000. The whole purpose of this book is to make you a better Windows programmer with an emphasis on both corporate and Windows 2000-specific programming.

Intended Audience

This book was written for the Visual C++ developer who has a good understanding of programming principles and has used Visual C++ in the past. In other words, this isn't a book for a complete novice, but someone with a little experience will get some information from it almost immediately. The first seven chapters of the book were written with the beginning- to intermediate-level programmer in mind.

As the book progresses, the topics get more complex and the anticipated understanding level of the reader increases. By the time you reach the chapters

on Windows 2000-specific features, like the ones on MTS, MSMQ, and Active Directory, I'm assuming that you're at least an intermediate reader who has spent some time programming. These topics are intermediate- to advanced-level programmer topics, and I wrote those chapters with that level of reader in mind. This doesn't, however, mean that I'm going to bury you with arcane information; the various topics are covered in simple terms that you'll find easy to understand.

The entire book is meant to help a wide variety of readers who want to know about Windows 2000 programming. We won't look at add-on products or other technologies; Windows 2000 is a complex topic that requires focused attention. With this in mind, know that you won't find a lot of esoteric information that some books provide. My goal is to give you the information you need along with resources you can use to find additional information as needed to complete your projects.

What This Book Covers

This book is designed to give you a good overview of Windows 2000-specific programming with an emphasis on corporate-level programming. There are also sections that deal specifically with new features, but not to the exclusion of many of the basics you need to know to write general applications. In short, this book is very generalized in some respects.

One of the few areas I did avoid was database management programming. Even though the book does touch on this topic in a few places, it isn't designed as any sort of database primer. The areas where you'll find database coverage are where the operating system requires such services to perform a task. For example, the Active Directory sections of the book do contain mentions of database programming.

This also isn't a COM/COM+ primer, though the book does touch on that topic in greater depth than it does database programming. You can't really work with Windows 2000 without knowing at least a little bit about COM and COM+. Microsoft has embedded this technology just about everywhere in the operating system.

Note that this book is also based on a beta version of Windows 2000. What this means is that what you see in the final version of Windows 2000 may vary a little from what I've outlined here. Microsoft has been known to change product features up until the very last release. In addition, please remember that any service packs or patches that Microsoft issues will further change what you see when using Windows 2000. In sum, I've provided the very best information available to me at the time of writing.

Organization

Now that you have a brief overview of what the book will and won't cover, let's look at the content in a little more detail. The following sections provide an overview of what you'll find in this book.

Part I: Fundamentals

Most programmers start writing code by developing simple applications, then enhance those applications as their coding skills improve. The first part of this book is going to help you do just that. We'll begin by looking at the coding environment, the basic application types, then we'll look at common enhancements to those basic applications. I'm not going to spend a lot of time in this area, so it's important that you already have some coding experience before you begin using this book.

So, what can you expect to see in these first six chapters of the book? Chapter 1,"Getting Started", provides a quick overview of Windows 2000 and some information on Visual C++ as well. We'll also cover a very important topic — the setup of a development workstation and test server.

Chapter 2, "A Programmer's Overview of Windows 2000," covers three essential topics: new Windows 2000 features, low-level features that you can use to improve your applications, and a description of the new security features. Chapter 3, "Building a Simple Application", is about the kinds of applications you can create with a compiler once you spend time working with it. This chapter is designed to introduce you to the various application types and to help show you how to create them in a systemized manner.

At this point, you're past the basic material and into the application-enhancement section of the book. Chapter 4, "Enhancing the Desktop Interface", talks about various kinds of resources used in Visual C++. You can enhance your applications in many ways through the use of simple resources; this chapter shows you how to use the major ones. Chapter 5, "Working with the Registry", talks about the Windows database for storing settings. This chapter shows you the basics of working with the registry and how to use it to store your application settings.

Chapter 6, "Programming Multithreaded Applications", tells you how applications can perform more than one task at a time. Multithreaded applications are better able to respond to user needs. The purpose of this chapter is to show you how to use threads in your application to make it perform better and do more with less code.

Part II: Programming Web-based Windows 2000 Applications

The Internet is one of the most important changes in the computer programming market today from the desktop application programming most of us did in the past.

Companies that want to stay in business will need to have a presence on the Internet to perform one of four tasks: consumer sales, company-to-company sales, product support, and employee assistance. Any developer who wants to remain competitive in today's market will need some level of Internet-programming skills. With that in mind, the four chapters in this part of the book help you understand some of the Microsoft technologies at your disposal for creating this new class of application.

One of the most important things to learn when working on the Internet is how to create a new class of application that combines the desktop with the Internet. Chapter 7, "Programming HTML Client Applications", shows you how to combine the best part of desktop applications with the resource handling that the Internet can provide. This chapter shows you how to work with DHTML in a way that will enhance your current applications.

You can't be sure that you're always going to work with employees that have specially designed applications. Most Internet applications still rely on the browser, and not all browsers are as advanced as Internet Explorer or Netscape Communicator. ISAPI is an often overlooked alternative to use to communicate with browser clients. Chapter 8, "Programming ISAPI Extensions", shows you how to work with the first kind of ISAPI application. Think of ISAPI Extensions as ASP on steroids. This chapter will show you how to create extremely flexible and customizable Web-page automation using ISAPI.

Chapter 9, "Programming ISAPI Filters", shows you how to modify the data stream as it arrives at the server and again when it leaves. There's no corollary for the ISAPI filter when it comes to Web-site programming. This chapter shows you how to use this powerful programming technology to make your Web site more secure and customizable.

Despite the powerful capabilities that ISAPI provides, writing an ISAPI Filter or ISAPI Extension requires a considerable amount of time. Sometimes you'll want the ease of creating a script that accesses a specially designed COM-based component to perform some task. The information in Chapter 10, "Using ASP", shows that scripts are easy to write and change. It also shows you how to use ASP to create Web pages that automatically react to changing environmental conditions.

Part III: Programming COM+ Applications

Any book on Windows 2000 programming must include COM+ programming techniques. This part of the book overviews the new features that Windows 2000 provides in the way of COM technology and helps you understand the role of COM+ when it comes to standard business applications. We'll look at everything from the desktop to remote communications. (Not all chapters in this part of the book include working examples because the tools required to create some types of COM+ application were still in development at the time of writing.)

The first topic we're going to cover in this part of the book is standard components — the kind you use with everything from desktop applications to Web pages on the Internet. Chapter 11, "Understanding ActiveX and COM", shows that you can't work with Windows 2000 and not bump into COM. This chapter provides an overview of both COM and its sibling, ActiveX.

Chapter 12, "Building ActiveX and COM+ Components Fundamentals", adds to the information provided in Chapter 11. It provides additional theory on the fundamentals of component technology, including the new COM+ technology provided in Windows 2000. Chapter 13, "Building ActiveX and COM+ Components Advanced Topics", takes what you learned in Chapters 11 and 12 and shows you how to create components. In fact, we'll look at two completely different methods for creating the same component (MFC and ATL) and compare the results. In short, this chapter will help you understand the value of using the right programming method for a particular component-creation task.

Now that you've spent some time learning about COM as a whole, it's time to look at some of the latest additions that Microsoft has made to COM technology, especially in the area of remote communications. Chapter 14, "Understanding the Distributed Component Object Model", talks about the oldest form of remote communication when working with COM. When COM was first developed, you always ran any components you created on the local machine. However, as networking technology improved, Microsoft decided to make COM cover a wider area. The result is DCOM — the topic covered in this chapter. Chapter 15, "Programming Transaction-oriented Applications with Microsoft Transaction Server", talks about one of the more important additions to Windows 2000 for COM+. This chapter looks at how MTS adds to standard COM, then shows you some practical examples of what makes this technology better than COM alone. Chapter 16, "Building Asynchronous Message-oriented Applications with Microsoft Message Queue Server", talks about the "e-mail" version of COM. More and more users need to access company information while on the road. Not only does MSMQ provide a good messaging technology, but it makes disconnected applications practical as well. This chapter looks at the theory behind MSMQ applications.

Part IV: Working with Windows 2000 Distributed Services

One of the main reasons to use any operating system is to gain access to the services that the operating system provides. Microsoft is constantly adding new services to the Windows operating system — services that allow you to write applications with more features, faster than ever before. This part of the book looks at a variety of services provided by Windows 2000. However, remember that Windows 2000 is an extremely complex operating system. Consider this part of the book to be a sampler of some of the more important services that you'll use to create the vast majority of standard applications. (Note that not all chapters will contain working examples because of the beta status of the operating system at the time of writing and the lack of development aids.)

Today, security is one of the most important issues for application writing of any kind, especially considering the recent rash of virus and worm attacks. Chapter 17, “Windows 2000 Security Fundamentals”, talks about the theory behind Windows 2000 security. This chapter provides you with an overview of what makes Windows 2000 security better than anything you’ve worked with in the past. Chapter 18, “Windows 2000 Security Advanced Topics”, is a follow-up to Chapter 17. We’ll take a detailed look at the various security-related programming resources that Windows 2000 provides, including both component technology and the methods used for Windows login.

Active Directory is an entirely new technology for Windows 2000. Think of Active Directory as a new kind of centralized database for storing all kinds of machine, user, and application data. This new database, like most new Microsoft technologies, is based on COM, so a good knowledge of COM fundamentals is necessary to read about Active Directory. Chapter 19, “Active Directory Services Fundamentals”, provides the theory you’ll need before you can start making yourapplication Active Directory-aware. Chapter 20, “Active Directory Services Advanced Topic”, adds to the information you’ve gained in Chapter 19. We’ll look at the programming methods you’ll need to know to implement Active Directory in your applications.

Until this point, this book has been about the needs of the user, the operating system, and even the devices attached to the machine. Chapter 21, “Creating Administrative Tools”, is designed to help you understand the needs of the network administrator and to get something out of this book for your own personal needs as well. Administrators and programmers alike need tools to perform their work. This chapter looks at what you’ll need to know to build simple dialog-based administrative utilities and MMC snap-ins.

In a world that is increasingly dependent on a global economy, packaging is everything. Chapter 22, “Packaging and Deploying Windows NT Applications”, is about the packaging element of application design. It doesn’t pay to create an application no one can use; yet many developers doom their applications to nonuse by failing to package their application properly. This chapter discusses what you need to know in order to create application packaging that gives the user the right impression from the start.

Keeping the user happy means writing bug-free applications that perform well given the current state of technology. Chapter 23, “Tuning and Performance Issues”, helps you to achieve the speed and efficiency goals of writing applications. This chapter shows you techniques that can make your applications smaller, faster, and more efficient to use.

System Requirements

I've made some assumptions while writing the application programming examples in this book. First, you need at least one machine running Windows 2000 Server. A better setup includes two machines: one with Windows 2000 Server and a second with Windows 2000 Professional. This two-machine setup is the only way that you'll see some technologies, like DCOM, in action, and truly know that they work as anticipated. Make absolutely certain that you set your machine up so that it'll work properly with Windows 2000 and the various test setups in the book. I've provided you with instructions on how to do this in Chapter 1.

All of the examples in this book were tested with Visual C++ 6.0 Enterprise Edition. They aren't guaranteed to work with any other version of the product, and some definitely won't work with the educational versions of the product. You need, at a minimum, Visual C++ 6.0 Professional Edition to work with most of the examples in this book.

You must install Service Pack 3 for Visual C++ 6.0 before any of the examples after Chapter 7 will work. Some examples, like the MTS example, won't even compile without this service pack in place. Other examples, like the DCOM example, may compile, but probably won't work very well without the service pack in place. I've provided information in several places in the book on where you can download the service pack. You'll also find it included with an MSDN subscription.

In some cases, you'll need additional tools because Visual C++ 6.0 was released to the market long before Windows 2000. The most important of these tools is the current release of the Platform SDK. I've provided information in the appropriate places about where you can download the Platform SDK and any other required tools. You can also get the vast majority of these tools from the CDs provided with an MSDN subscription.

Conventions

Several conventions are used within this book that will help you get more out of it. The first is the use of special fonts or font styles to emphasize a special kind of text; the second is the use of icons to emphasize special information.

- There are some situations in which I'll ask you to type something. This information always appears in bold type like this: Type **Hello World**.
- Code normally appears on lines separate from the rest of the text. However, there are some special situations in which small amounts of code appear right in the paragraph for explanatory purposes. This code will appear in a special font like this: `Some Special Code`.

- Definitions are always handy to have. I'll use italicized text to differentiate definitions from the rest of the text like this: A *CPU* is a required part of your machine.
- In some cases, I won't have an exact value to provide, so I'll give you an idea of what you should type by enclosing it in angle brackets like this: Provide a <Machine Name> value for the Name field.
- You'll always be able to recognize menu selections and command sequences because they're written like this: Use the File | Open command.

The following icons identify useful and important asides from the main text.

Notes help you understand a principle or provide amplifying information. In many cases, a note is used to emphasize a piece of critical information that you need.

Any time you see a Caution icon, make sure you take special care to read it. This information is vital. I'll always use the Caution to designate information that will help you avoid damage to your application, data, machine, or self. Never skip the Cautions in a chapter and always follow the advice they contain.

All of us like to know special bits of information that will make our job easier, more fun, or faster to perform. Tips help you get the job done faster and more safely. In many cases, the information found in a Tip is drawn from experience, rather than through experimentation or the documentation.

Finding what you need quickly is more important than ever before. Many people work at a pace that they call Internet time. They no longer have the luxury of performing hours of research to find that magic piece of information needed to complete an application. With this in mind, I've spent the time you don't have to find unique information sources on the Internet. This icon will always provide that information so that you can get what you need quickly.

You're going to see a lot of example code in this book. The CD-ROM icon will help you find application source code on the CD that accompanies the book. It's important to follow along with the book whenever possible so that you can get the most out of the information provided. The demo programs on the CD help you do just that.

This icon points you to additional information on a topic in sources that include Web sites, other books, or other sections and chapters in this book.

Acknowledgments

Thanks to my wife, Rebecca, for working with me to get this book completed. I really don't know what I would have done without her help in proofreading my rough draft. Both Rebecca and Micah Schlobohm deserve thanks for helping to research, compile, and edit some of the information that appears in this book. Micah worked especially hard in helping me set up the various lab environments required to test Windows 2000 features. I also appreciate her help in compiling the information on SAMI and the Windows accessibility features.

Russ Mullen deserves thanks for his technical edit of this book. Russ greatly added to the accuracy and depth of the material you see here. In addition, he spent many hours working with me through e-mail to find solutions to some of the problems that Windows 2000 presented, and he is responsible for providing many of the Web-site addresses sprinkled throughout the book.

Matt Wagner, my agent, deserves credit for helping me get the contract in the first place and taking care of all the details that most authors don't really think about.

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